This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

---

1. Simplify the expression below and choose the interval the simplification is contained within.

$$19 - 18^2 + 6 \div 9 * 11 \div 3$$

The solution is -302.556, which is option C.

A. $[-306.98, -303.98]$

-304.980, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

B. $[343.44, 350.44]$

345.444, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

C. $[-303.56, -299.56]$

* -302.556, this is the correct option

D. $[338.02, 345.02]$

343.020, which corresponds to two Order of Operations errors.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

2. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\frac{0}{11\pi} + \sqrt{9}i$$

The solution is Pure Imaginary, which is option E.

A. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

B. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

C. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

D. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

E. Pure Imaginary

* This is the correct option!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

3. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{-54 + 88i}{2 + 4i}$$

The solution is $12.20 + 19.60i$, which is option E.

A. $a \in [243, 246]$ and $b \in [19, 20]$

$244.00 + 19.60i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

B. $a \in [-24, -22.5]$ and $b \in [-2.5, -1.5]$

$-23.00 - 2.00i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

C. $a \in [-28, -26.5]$ and $b \in [21, 23]$

$-27.00 + 22.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

D. $a \in [10.5, 12.5]$ and $b \in [390.5, 393]$

$12.20 + 392.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

E. $a \in [10.5, 12.5]$ and $b \in [19, 20]$

* $12.20 + 19.60i$, which is the correct option.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

4. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{4225}{25}}$$

The solution is Integer, which is option D.

A. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

B. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

C. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

D. Integer

* This is the correct option!

E. Irrational

These cannot be written as a fraction of Integers.

General Comment: First, you **NEED** to simplify the expression. This question simplifies to -65.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

5. Simplify the expression below and choose the interval the simplification is contained within.

$$11 - 12^2 + 5 \div 16 * 2 \div 3$$

The solution is -132.792, which is option B.

A. $[155.1, 155.41]$

155.208, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

B. $[-132.91, -132.73]$

* -132.792, this is the correct option

C. $[-133.09, -132.89]$

-132.948, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

D. $[154.88, 155.12]$

155.052, which corresponds to two Order of Operations errors.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

6. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(2 - 10i)(5 + 8i)$$

The solution is $90 - 34i$, which is option C.

A. $a \in [-70, -65]$ and $b \in [61, 72]$

$-70 + 66i$, which corresponds to adding a minus sign in the first term.

B. $a \in [87, 93]$ and $b \in [30, 38]$

$90 + 34i$, which corresponds to adding a minus sign in both terms.

C. $a \in [87, 93]$ and $b \in [-37, -31]$

* $90 - 34i$, which is the correct option.

D. $a \in [-70, -65]$ and $b \in [-69, -63]$

$-70 - 66i$, which corresponds to adding a minus sign in the second term.

E. $a \in [7, 14]$ and $b \in [-82, -77]$

$10 - 80i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

7. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-8 + 4i)(5 + 7i)$$

The solution is $-68 - 36i$, which is option E.

A. $a \in [-69, -62]$ and $b \in [33, 39]$

$-68 + 36i$, which corresponds to adding a minus sign in both terms.

B. $a \in [-16, -4]$ and $b \in [-77, -75]$

$-12 - 76i$, which corresponds to adding a minus sign in the first term.

C. $a \in [-41, -38]$ and $b \in [25, 29]$

$-40 + 28i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

D. $a \in [-16, -4]$ and $b \in [74, 83]$

$-12 + 76i$, which corresponds to adding a minus sign in the second term.

E. $a \in [-69, -62]$ and $b \in [-38, -35]$

* $-68 - 36i$, which is the correct option.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

8. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{140625}{625}}$$

The solution is Whole, which is option D.

A. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

B. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

C. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

D. Whole

* This is the correct option!

E. Irrational

These cannot be written as a fraction of Integers.

General Comment: First, you **NEED** to simplify the expression. This question simplifies to 375.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

9. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\frac{4}{2} + 64i^2$$

The solution is Rational, which is option E.

A. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

B. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

C. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

D. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

E. Rational

* This is the correct option!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

10. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{72 + 44i}{5 + 2i}$$

The solution is $15.45 + 2.62i$, which is option D.

A. $a \in [14.5, 16]$ and $b \in [75, 77]$

$15.45 + 76.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

B. $a \in [8, 10]$ and $b \in [12, 14]$

$9.38 + 12.55i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

C. $a \in [14, 15]$ and $b \in [20.5, 22.5]$

$14.40 + 22.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

D. $a \in [14.5, 16]$ and $b \in [1.5, 3]$

* $15.45 + 2.62i$, which is the correct option.

E. $a \in [447.5, 449]$ and $b \in [1.5, 3]$

$448.00 + 2.62i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

11. Simplify the expression below and choose the interval the simplification is contained within.

$$4 - 2^2 + 1 \div 20 * 19 \div 5$$

The solution is 0.190, which is option A.

A. $[0.18, 0.27]$

* 0.190, this is the correct option

B. $[-0.03, 0.13]$

0.001, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

C. $[7.96, 8.06]$

8.001, which corresponds to two Order of Operations errors.

D. $[8.17, 8.23]$

8.190, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

12. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{-2178}{11}}i + \sqrt{165}i$$

The solution is Nonreal Complex, which is option A.

A. Nonreal Complex

* This is the correct option!

B. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

C. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

D. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

E. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

13. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{63 + 88i}{4 - 3i}$$

The solution is $-0.48 + 21.64i$, which is option B.

A. $a \in [15.5, 18.5]$ and $b \in [-29.5, -28.5]$

$15.75 - 29.33i$, which corresponds to just dividing the first term by the first term and the second by the second.

B. $a \in [-1, 0]$ and $b \in [20.5, 23]$

* $-0.48 + 21.64i$, which is the correct option.

C. $a \in [-13, -10]$ and $b \in [20.5, 23]$

$-12.00 + 21.64i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

D. $a \in [19.5, 21.5]$ and $b \in [6, 7]$

$20.64 + 6.52i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

E. $a \in [-1, 0]$ and $b \in [540.5, 542.5]$

$-0.48 + 541.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

14. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{53361}{441}}$$

The solution is Whole, which is option B.

A. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

B. Whole

* This is the correct option!

C. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

D. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

E. Irrational

These cannot be written as a fraction of Integers.

General Comment: First, you **NEED** to simplify the expression. This question simplifies to 231.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

15. Simplify the expression below and choose the interval the simplification is contained within.

$$9 - 19^2 + 13 \div 4 * 15 \div 1$$

The solution is -303.250, which is option A.

A. $[-305.25, -301.25]$

* -303.250, this is the correct option

B. $[368.22, 380.22]$

370.217, which corresponds to two Order of Operations errors.

C. $[416.75, 420.75]$

418.750, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

D. $[-360.78, -350.78]$

-351.783, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

16. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(2 - 10i)(-8 - 3i)$$

The solution is $-46 + 74i$, which is option E.

A. $a \in [-18, -11]$ and $b \in [27, 31]$

$-16+30i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

B. $a \in [11, 15]$ and $b \in [82, 90]$

$14 + 86i$, which corresponds to adding a minus sign in the second term.

C. $a \in [-50, -38]$ and $b \in [-74, -69]$

$-46 - 74i$, which corresponds to adding a minus sign in both terms.

D. $a \in [11, 15]$ and $b \in [-88, -85]$

$14 - 86i$, which corresponds to adding a minus sign in the first term.

E. $a \in [-50, -38]$ and $b \in [73, 76]$

* $-46 + 74i$, which is the correct option.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

17. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(-8 - 9i)(10 - 4i)$$

The solution is $-116 - 58i$, which is option A.

A. $a \in [-118, -110]$ and $b \in [-60, -52]$

* $-116 - 58i$, which is the correct option.

B. $a \in [-46, -43]$ and $b \in [-123, -115]$

$-44 - 122i$, which corresponds to adding a minus sign in the second term.

C. $a \in [-118, -110]$ and $b \in [52, 60]$

$-116 + 58i$, which corresponds to adding a minus sign in both terms.

D. $a \in [-46, -43]$ and $b \in [115, 125]$

$-44 + 122i$, which corresponds to adding a minus sign in the first term.

E. $a \in [-81, -74]$ and $b \in [34, 39]$

$-80 + 36i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

---

18. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{39204}{484}}$$

The solution is Integer, which is option A.

A. Integer

* This is the correct option!

B. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

C. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

D. Irrational

These cannot be written as a fraction of Integers.

E. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to -198.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

19. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{-910}{5}}i + \sqrt{156}i$$

The solution is Nonreal Complex, which is option D.

A. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

B. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

C. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

D. Nonreal Complex

* This is the correct option!

E. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

20. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{72 - 77i}{-6 + 2i}$$

The solution is $-14.65 + 7.95i$, which is option A.

A. $a \in [-15, -14]$ and $b \in [7, 9.5]$

* $-14.65 + 7.95i$, which is the correct option.

B. $a \in [-15, -14]$ and $b \in [316.5, 319]$

$-14.65 + 318.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

C. $a \in [-12.5, -11.5]$ and $b \in [-39, -38]$

$-12.00 - 38.50i$, which corresponds to just dividing the first term by the first term and the second by the second.

D. $a \in [-8, -6]$ and $b \in [14.5, 16.5]$

$-6.95 + 15.15i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

E. $a \in [-587, -585.5]$ and $b \in [7, 9.5]$

$-586.00 + 7.95i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

21. Simplify the expression below and choose the interval the simplification is contained within.

$$9 - 1 \div 10 * 11 - (20 * 4)$$

The solution is -72.100, which is option B.

A. $[85.3, 89.7]$

88.991, which corresponds to not distributing addition and subtraction correctly.

B. $[-72.5, -71.4]$

* -72.100, which is the correct option.

C. $[-71.1, -69.5]$

-71.009, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

D. $[-49.3, -47.3]$

-48.400, which corresponds to not distributing a negative correctly.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

---

22. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\frac{8}{0} + \sqrt{80}i$$

The solution is Not a Complex Number, which is option B.

A. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

B. Not a Complex Number

* This is the correct option!

C. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

D. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

E. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

---

23. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{-45 - 11i}{8 + 4i}$$

The solution is $-5.05 + 1.15i$, which is option E.

A. $a \in [-4.5, -3.5]$ and $b \in [-3.5, -2.9]$

$-3.95 - 3.35i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

B. $a \in [-7, -5.5]$ and $b \in [-3.2, -2.7]$

$-5.62 - 2.75i$, which corresponds to just dividing the first term by the first term and the second by the second.

C. $a \in [-405.5, -403.5]$ and $b \in [0.9, 1.6]$

$-404.00 + 1.15i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

D. $a \in [-5.5, -4]$ and $b \in [91.45, 92.9]$

$-5.05 + 92.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

E. $a \in [-5.5, -4]$ and $b \in [0.9, 1.6]$

* $-5.05 + 1.15i$, which is the correct option.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.

---

24. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{22}{0}}$$

The solution is Not a Real number, which is option D.

A. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

B. Irrational

These cannot be written as a fraction of Integers.

C. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

D. Not a Real number

* This is the correct option!

E. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $-\sqrt{\frac{22}{0}}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

---

25. Simplify the expression below and choose the interval the simplification is contained within.

$$1 - 3^2 + 19 \div 15 * 17 \div 16$$

The solution is -6.654, which is option C.

A. $[9.55, 10.63]$

10.005, which corresponds to two Order of Operations errors.

B. $[10.15, 13.6]$

11.346, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

C. $[-7.07, -6.63]$

* -6.654, this is the correct option

D. $[-9.06, -7.76]$

-7.995, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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26. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(6 - 5i)(-7 - 10i)$$

The solution is $-92 - 25i$, which is option A.

A. $a \in [-98, -89]$ and $b \in [-25, -21]$

* $-92 - 25i$, which is the correct option.

B. $a \in [-44, -40]$ and $b \in [43, 53]$

$-42+50i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

C. $a \in [-98, -89]$ and $b \in [23, 28]$

$-92 + 25i$, which corresponds to adding a minus sign in both terms.

D. $a \in [7, 11]$ and $b \in [-95, -92]$

$8 - 95i$, which corresponds to adding a minus sign in the first term.

E. $a \in [7, 11]$ and $b \in [88, 96]$

$8 + 95i$, which corresponds to adding a minus sign in the second term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

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27. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(5 - 8i)(-4 + 2i)$$

The solution is $-4 + 42i$, which is option B.

A. $a \in [-42, -31]$ and $b \in [-23, -21]$

$-36 - 22i$, which corresponds to adding a minus sign in the first term.

B. $a \in [-6, -2]$ and $b \in [37, 48]$

* $-4 + 42i$, which is the correct option.

C. $a \in [-42, -31]$ and $b \in [21, 25]$

$-36 + 22i$, which corresponds to adding a minus sign in the second term.

D. $a \in [-22, -19]$ and $b \in [-21, -14]$

$-20-16i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.

E. $a \in [-6, -2]$ and $b \in [-47, -35]$

$-4 - 42i$, which corresponds to adding a minus sign in both terms.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.

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28. Choose the **smallest** set of Real numbers that the number below belongs to.

$$-\sqrt{\frac{2574}{13}}$$

The solution is Irrational, which is option C.

A. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

B. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

C. Irrational

* This is the correct option!

D. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

E. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to $-\sqrt{198}$.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number.

Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

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29. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\sqrt{\frac{-1430}{10}} + \sqrt{154}$$

The solution is Nonreal Complex, which is option E.

A. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

B. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

C. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

D. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

E. Nonreal Complex

* This is the correct option!

General Comment: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

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30. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{36 + 33i}{-2 + 6i}$$

The solution is $3.15 - 7.05i$, which is option E.

A. $a \in [2.5, 4]$ and $b \in [-282.5, -281]$

$3.15 - 282.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

B. $a \in [-19, -17.5]$ and $b \in [5, 6.5]$

$-18.00 + 5.50i$, which corresponds to just dividing the first term by the first term and the second by the second.

C. $a \in [-7, -6]$ and $b \in [3, 4.5]$

$-6.75 + 3.75i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

D. $a \in [125, 127]$ and $b \in [-8, -6.5]$

$126.00 - 7.05i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

E. $a \in [2.5, 4]$ and $b \in [-8, -6.5]$

* $3.15 - 7.05i$, which is the correct option.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2 + 3i$, the conjugate is $2 - 3i$.
